I and II. The accompanying table exhibits a few facts regarding the apparent place of origin and disappearance of these highs and lows, their duration, length of path, and velocity. The most remarkable feature of these paths during the month is the fact that both high and low areas all passed to the ocean off Newfoundland. Another peculiarity is their very great apparent velocity, reaching 36.6 miles an hour in the case of the lows.

HIGHS.

These conditions in general took their origin to the north of Montana, though the permanent high area in the middle Plateau Region gave rise to several. Owing to the continuance of the rather permanent high pressure in the middle Plateau Region the temperature conditions were rather moderate in the Mississippi Valley and eastward to the Atlantic Coast. As high No. V moved toward the Mississippi Valley it caused a fall in temperature of 32° in twenty-four hours and to 36° at Memphis, 13th, a. m. The next morning there was a fall of 32° in twenty-four hours at Cleveland.

LOWS.

The lows of the month have had a peculiar distribution in that six of them have begun off the south Pacific Coast or in the extreme Southwest; five of them to the north of Montana, and one off the north Pacific Coast. They have all moved to the Gulf of St. Lawrence. As No. VI moved to the north of Arkansas on the night of the 11th a severe tornado occurred at Fort Smith in the southeast quadrant.

The highest wind of the month was 68 miles an hour at Chicago, afternoon of 22d, and while low area No. IX approached the Lake Region.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	3, a. m.	50	87	5, a. m.	46	62	1,370	2.0	685	28.5
II	3, a. m.	42	111	6, p. m.	45	50	2,860	3.5	817	34.0
III	4, p. m.	43	114	9, a. m.	28	80	2,690	4.5	598	24.9
IV	8, p. m.	53	119	12, a. m.	47	59	2,680	3.5	766	31.9
V	12, p. m.	45	114	15, p. m.	46	58	3,040	3.0	1,013	42.2
VI	12, p. m.	54	116	20, p. m.	47	60	4,400	8.0	550	22.9
VII	20, p. m.	34	89	23, a. m.	47	57	1,920	2.5	768	32.0
VIII	21, p. m.	40	113	25, p. m.	47	67	3,150	4.0	787	32.8
IX	25, a. m.	50	119	28, p. m.	47	74	2,100	3.5	600	25.0
X	28, a. m.	54	109	31, p. m.	47	56	2,800	3.5	800	33.3
Total							27,010	38.0	7,384	
Mean of 10 tracks							2,701		738	30.8
Mean of 38 days									711	29.6
Low areas.										
I	1, p. m.	54	111	4, a. m.	48	54	2,680	2.5	1,072	44.7
II	2, a. m.	51	111	6, a. m.	47	54	2,950	4.0	843	35.1
III	4, p. m.	53	116	7, p. m.	46	58	2,840	3.0	947	39.5
IV	6, a. m.	51	115	9, a. m.	47	59	2,580	3.0	860	35.8
V	7, p. m.	37	100	10, p. m.	48	51	2,750	3.0	917	38.2
VI	10, p. m.	32	105	13, p. m.	48	55	2,980	3.0	993	41.4
VII	12, a. m.	34	120	16, p. m.	46	56	4,030	4.5	895	37.3
VIII	17, p. m.	31	103	21, p. m.	45	56	3,160	4.0	790	32.9
IX	19, p. m.	32	115	24, p. m.	49	56	3,690	5.0	738	30.8
X	23, a. m.	21	114	27, a. m.	47	55	3,570	4.0	892	37.2
XI	26, a. m.	53	115	29, p. m.	43	58	2,920	3.5	834	34.8
XII	28, p. m.	48	128	2, a. m.*	48	64	3,390	4.5	753	31.4
Total							37,540	44.0	10,534	
Mean of 12 tracks							3,128		878	36.6
Mean of 44.0 days									853	35.5

* February.

THE WEATHER OF THE MONTH.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

The statistical aspect of the weather of the month is presented in the tables which form the closing part of this REVIEW. The numerical values of the tables have been generalized in a number of cases, the results appearing on Charts Nos. III to IX, inclusive. Table I in particular contains a variety of details from which the reader may select those most interesting to himself.

PRESSURE AND WIND.

In the United States in January the map of normal isobars shows that a ridge of high pressure extends diagonally across the country from Georgia to Washington. There are two areas in this ridge of high pressure with values over 30.20 inches, viz, one in the west covering Utah, Nevada, and portions of the adjoining States of Oregon, Idaho, Wyoming, and Colorado, and one in the east overlying the mountainous regions of Tennessee, northern Georgia, and parts of the Carolinas. Pressure is lowest over the north Pacific Coast and the Canadian Maritime Provinces, whence it decreases to the permanent areas of low pressure occupying the North Atlantic and Bering Sea, respectively.

The normal prevailing winds on the Atlantic and Gulf coasts are from the northwest and north, from the colder land to the warmer water surface. On the Pacific Coast the winds generally coincide with the direction of the coast line; on the upper half of the coast, say from Eureka northward, southerly winds are most likely to prevail; on the southern half northerly winds are most frequent. The winds of the Plateau and Rocky Mountain regions are somewhat variable, southwesterly winds generally prevailing west of the mountains and northwesterly on the easterly slope and the plains beyond. The winds of the middle and upper Mississippi Valley are westerly or northwesterly; westerly winds also prevail in the upper Lake Region, while the winds of the lower Lake Region and Ohio Valley are generally southwesterly.

In January, 1898, pressure was higher than usual on the north and middle Pacific Coasts, over the Plateau Region, and the lower portion of the Florida Peninsula. Elsewhere it was lower than the average. The notable feature of the month was the very high pressure over the Plateau Region. The position and magnitude of the area of high pressure in this region determine, in a great measure, the character of the weather on the Pacific Coast, and also in a somewhat less degree east of the Rocky Mountains.

It will be noticed by an inspection of Chart IV that the western area of high pressure extends farther to the westward and northward than usual, thus giving cold northerly and northeasterly winds to California and Arizona. On the northern and northeastern sides of the high the winds were southwesterly or southerly, and the weather of Montana and the Dakotas was relatively warm and pleasant. The pressure distribution of the present month is very similar to that of January, 1891, as may easily be seen by a comparison of Chart II of the REVIEW for that month with Chart IV of the current REVIEW. There is also a marked similarity between the conditions of temperature and rainfall of the two months.

TEMPERATURE OF THE AIR.

The normal temperature of the air in the United States in January varies from about 70° at Key West, 56° at Jacksonville, 54° at New Orleans, Galveston, and San Diego to

20° at Eastport, 18° at Burlington, 24° at Buffalo, 25° at Detroit, 9° at Duluth, 6° below zero at St. Vincent, 8° above at Havre, 24° at Spokane, and 39° at Seattle on Puget Sound. The warmest regions, as may be seen from the above figures, are the South Atlantic, Gulf, and Pacific Coast States; the coldest are the Red River Valley of the North and contiguous territory. The Pacific Coast is somewhat warmer than the Atlantic, and both are considerably warmer than the interior. How much warmer may easily be seen by an examination of the numerical values in Table I.

The month was generally mild and open east of the Rocky Mountains, on the north Pacific Coast, and throughout northern Idaho and Montana. In the Valley of the Red River of the North and throughout portions of North Dakota, the coldest part of the United States, the month averaged about 15° warmer than usual. It was colder than usual throughout California and the Plateau Region eastward to the eastern foothills of the Rocky Mountains and southward to the Mexican boundary line.

East of the Rocky Mountains the month was considerably warmer than usual except in Maine, northern New Hampshire, and Vermont.

The observing stations in the Rocky Mountain and Plateau regions, widely separated as they are, show, nevertheless, the influence of local environment in a number of instances. The effect of Chinook or fœhn winds in northern Idaho, northwestern Montana, and elsewhere, may be seen by an examination of the surface isotherms on Chart VI.

In the case of the fœhn winds of Montana and Idaho it is to be observed that almost equally high temperatures prevailed on both sides of the mountain range. This fact is shown in the following table:

West of the Range.			East of the Range.		
Stations.	Elevation.	Mean temperature.	Stations.	Elevation.	Mean temperature.
	Feet.	°		*Feet.*	°
Colfax, Wash.	2,300	27.3	Augusta, Mont.	3,500	26.6
Rosalia, Wash.	2,300	24.8	Dupuyer, Mont.	.....	28.4
Spokane, Wash.	1,943	26.0	Fort Benton, Mont.	2,663	29.6
Cœur d'Alene, Idaho.	.....	27.4	Greatfalls, Mont.	3,350	30.7
Fort Sherman, Idaho	2,196	26.2	Troy, Mont.	2,250	24.6
Kootenai, Idaho	1,750	24.6			
St. Maries, Idaho.	.....	28.2			

All of the stations in the first column of the above table are west of the main chain of the Cœur d'Alenes, except Kootenai. The latter is a small station on the Great Northern Railway at the head of Lake Pend O'Reille, where Clarks Fork, of the Columbia, breaks through the Cœur d'Alenes from the southeast. The stations in the fourth column all lie to the eastward of the main chain of the Rocky Mountains, except Troy. The latter, a station on the Great Northern Railway, is situated in the northeastern end of a valley on the Kootenai River, about 40 miles long and from 5 to 8 miles wide. The valley is flanked on either side by mountains ranging from 5,000 to 9,000 feet above sea level. Its general direction is northwesterly and southeasterly. Kootenai is about 80 miles west of Troy on the western side of the Cabinet Range of mountains, while Troy is on the eastern side.

The remaining stations under the heading "east of the range" are situated on the plains at distances varying from 20 to 100 miles from the 5,000-foot contour line which marks the eastern base of the main chain of the Rocky Mountains.

The temperature conditions above noted are not permanent, but depend, partly upon the contour of the land surface, and partly upon the pressure distribution over Oregon, Nevada, and Utah. There are a few other localities in the Plateau Region where the temperature appears to be higher on the average than would be expected *a priori*. One in particular is found in the Snake River Valley, southwestern Idaho. Present observations are insufficient, however, to delimit the region with accuracy.

A cold wave of rather more than ordinary severity passed over Florida and the South Atlantic States on the 1st, 2d, and 3d. Minimum temperatures of 24° at Jacksonville, 28° at Tampa, and 30° at Jupiter were registered, while heavy frosts occurred as far south as the last-named place. This cold wave brought the lowest temperatures of the month to the region from Missouri, Arkansas, Oklahoma, and Texas eastward to the Atlantic. The cold wave of the 29–30th, which moved from the Great Lakes eastward, brought the lowest temperature of the month throughout the Lake Region and New England.

The distribution of the observed monthly mean temperature of the air over the United States and Canada is shown by red lines (isotherms) on Chart VI. This chart also shows the maximum and the minimum temperatures, the former by broken the latter by dotted lines. As will be noticed, these lines have been drawn over the Rocky Mountain Plateau Region, although the temperatures have not been reduced to sea level; the isotherms relate, therefore, to the average surface of the country in the neighborhood of the various observers, and as such must differ greatly from the sea-level isotherms of Chart IV.

The average temperatures of the respective geographic districts, the departures from the normal of the current month and from the general mean since the first of the year, are presented in the table below for convenience of reference:

Average temperature and departures from the normal.

Districts.	Number of stations.	Average for the current month.	Departure for the—	
			Current month.	Interval since January 1.
		°	°	
New England	10	27.0	+ 0.2	
Middle Atlantic	12	35.6	+ 3.1	
South Atlantic	10	50.7	+ 4.2	
Florida Peninsula	3	65.7	+ 1.0	
East Gulf	7	54.7	+ 4.5	
West Gulf	7	52.6	+ 6.0	
Ohio Valley and Tennessee	12	39.6	+ 5.3	
Lower Lake	8	29.2	+ 3.9	
Upper Lake	9	23.6	+ 5.6	
North Dakota	3	17.6	+15.1	
Upper Mississippi	11	28.8	+ 7.7	
Missouri Valley	10	29.3	+ 9.2	
Northern Slope	7	22.1	+ 5.0	
Middle Slope	6	31.7	+ 3.6	
Southern Slope	2	40.9	+ 4.2	
Southern Plateau	4	40.9	— 3.1	
Middle Plateau	3	21.0	— 8.0	
Northern Plateau	4	21.6	— 1.8	
North Pacific	9	39.8	+ 0.9	
Middle Pacific	5	44.3	— 2.8	
South Pacific	4	47.9	— 2.7	

In Canada.—Professor Stupart says:

The temperature conditions over the Dominion were, on the whole, decidedly abnormal, as in the Northwest Territories the mean for the month was from 11° to 16° above average, the greatest excess being in Alberta, while in the Province of New Brunswick the mean was from 4° to 7° below average. * * * The change between the unusual mildness of Alberta and the abnormal cold of New Brunswick was gradual from west to east, and the Ottawa and upper St. Lawrence valleys and also Vancouver Island were the only parts of the Dominion where the mean temperature was just equal to the average.

Review of the season.—The present winter has been colder than usual on the Pacific Coast and Plateau Region. Minimum temperatures in the Great Valley of California during December, 1897, were 27° at Redbluff, 28° at Sacramento, and 23° at Fresno. During the present month they were 24° at Redbluff, 26° at Sacramento, and 24° at Fresno. In

southern California minimum temperatures of 36° were recorded at San Diego in both December, 1897, and January, 1898. This is but 4° above the lowest point reached at that station in the last twenty-five years. The lowest temperatures hitherto recorded in the Great Valley are 18° at Redbluff, 19° at Sacramento, and 20° at Fresno.

East of the Rocky Mountains the winter thus far has been mild and open. No cold waves of unusual severity have passed over the country. Navigation between the American and Canadian sides of the St. Marys River at Sault Ste. Marie remained open until December 30; Lake Erie was also open to navigation in some portions as late as January 15.

The present season resembles very much the mild winter of 1890–91.

PRECIPITATION.

[In inches and hundredths.]

The normals for January show two regions of heavy precipitation, viz, one on the north Pacific Coast, the other in the lower Mississippi Valley. The regions of moderate precipitation are portions of California, the Puget Sound country, and the Willamette Valley west of the Rocky Mountains, the middle Mississippi Valley, the Lake Region and Ohio Valley, the Atlantic seaboard, New England, and Florida in the east. The regions of scant or variable precipitation are the upper Mississippi and Missouri valleys, the plains west of the one hundredth meridian, and the Rocky Mountain and Plateau regions. Under normal conditions, therefore, the greater part of the United States lies within the region of moderately heavy rains or snows, aggregating, say, from 2 to 4 inches during the month.

Averages and departures by districts are summarized for convenience of reference in the following table:

Average precipitation and departures from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Since Jan. 1.
		Inches.		*Inches.*	
New England	10	4.57	115	+0.60	.....
Middle Atlantic	12	2.94	81	−0.70	.....
South Atlantic	10	1.59	37	−2.70	.....
Florida Peninsula	3	0.37	14	−2.30	.....
East Gulf	7	2.67	52	−2.50	.....
West Gulf	7	4.03	114	+0.50	.....
Ohio Valley and Tennessee	12	7.11	169	+2.90	.....
Lower Lake	8	3.88	145	+1.20	.....
Upper Lake	9	2.39	114	+0.30	.....
North Dakota	3	0.12	19	−0.50	.....
Upper Mississippi	11	2.88	162	+1.10	.....
Missouri Valley	10	1.48	137	+0.40	.....
Northern Slope	7	0.88	56	−0.30	.....
Middle Slope	6	1.69	190	+0.80	.....
Southern Slope	2	0.80	100	0.00	.....
Southern Plateau	4	0.82	158	+0.30	.....
Middle Plateau	3	0.58	35	−1.10	.....
Northern Plateau	4	1.48	65	−0.80	.....
North Pacific	9	4.98	62	−3.10	.....
Middle Pacific	5	1.50	27	−4.00	.....
South Pacific	4	1.19	43	−1.60	.....

The geographic distribution of precipitation for the current month is shown on Chart III. Much rain (10 inches on the average) fell in the Ohio and middle Mississippi valleys over a strip of country about 200 miles wide and 700 miles long. The fall on both sides of this area decreased quite rapidly, there being less than 0.50 of an inch on the Georgia coast and over the Florida Peninsula. The fall was moderately heavy in the lower Lake Region, St. Lawrence Valley, Canada, and New England, but light on the Pacific Coast. More rain falls on the north Pacific Coast than is required for agricultural purposes, hence a deficit in that region is of little economic importance. In California, on the other hand, when precipitation falls far short of the normal quantity, the results are likely to be disastrous. The current month, as well as December, 1897, was one of greatly diminished rainfall on the Pacific Coast, not, however, to the permanent injury of winter grains.

The precipitation of the Rocky Mountain and Plateau regions, so far as can be determined from relatively low-level stations, was a little less than the normal amount.

In Canada.—Prof. R. F. Stupart says:

The precipitation appears to have been rather heavy in most parts of British Columbia, being chiefly in the form of rain on the lower mainland and snow on upper levels. In the Northwest Territories and Manitoba it averaged about 5 inches of snow, or roughly speaking, about half the ordinary January fall. From the north shore of Lake Superior, eastward to the lower St. Lawrence Valley, and including the Parry Sound and Nipissing districts, the snowfall was scarcely equal to the average, but in the more southern parts of Ontario, and generally in the Ottawa and St. Lawrence valleys, the combined rainfall and snowfall was in excess of the average. In the Maritime Provinces the precipitation was chiefly snow, and was a little less than average, except in Cape Breton and Prince Edward Island.

SNOWFALL.

The total snowfall for the current month is given in Tables I and II, and its geographic distribution is shown on Chart VIII. Very little snow fell south of the thirty-fifth parallel, except over the Mountain and Plateau regions of the west. In Arizona and southern California there appears to have been considerable snowfall in the mountains, sufficient, so it is claimed, to insure an abundance of water for irrigation in the valleys below. The snowfall of eastern Montana, the Dakotas, and northern Minnesota was light for the season. Heavy snow, 10 to 20 inches or more, fell in eastern Kansas, Missouri, Iowa, southern Wisconsin, northern Illinois, and over the upper half of the lower peninsula of Michigan, also throughout northern New York and New England; the snowstorm of January 31 was particularly severe in the last-named district. Snow did not extend as far south as usual.

Snow on ground at end of month.—There were from 10 to 30 inches of snow on the ground at the end of the month in New England and northern New York; 20 to 40 in northern Michigan, and also on the upper peninsula; and about 10 inches in portions of New York, Michigan, Wisconsin, Illinois, Iowa, and Missouri. Elsewhere, excepting the mountainous regions of the far west, there was generally less than 5 inches. Since December 31, 1897, the snow covering has become heavier in New England and the upper Lake Region, and its southern limit in the Rocky Mountain Plateau Region has been extended to include the higher levels of Arizona and New Mexico. The southern limit of snow east of the Rocky Mountains is about the same as one month ago.

ICE IN THE RIVERS AND HARBORS AT THE CLOSE OF THE MONTH.

The Snow and Ice Chart of January 31, 1898, as prepared by the Climate and Crop Division, contains the following:

As compared with the corresponding date of 1897 there is now somewhat more ice at some stations in New England, the upper Lake Region, and in the upper Mississippi River, but in the Missouri River there is decidedly less, the ice at the close of January, 1897, ranging from 2 to 7 inches more than at this date. There was also very much more ice in the lower Lake Region and Middle Atlantic States at the close of January, 1897, than at this date. The Ohio River is now free from ice, and at the corresponding date last year it was frozen southward to Louisville, the ice ranging from 3 to 6 inches. On February 1, 1897, there was 6 inches of ice in the James River at Richmond, Va.

In Canada.—Prof. R. F. Stupart reports the following figures:

Medicine Hat, 24 inches, increase of 8 inches during the month; Minnedosa, 20 inches, increase of 2 inches; White River, 25 inches, increase of 3 inches; Parry Sound, 11 inches, increase of 7 inches; Rockliffe, 12 inches, increase of 6 inches; Yarmouth, 11 inches, increase of 9 inches; Halifax, 2 inches.

HAIL.

The following are the dates on which hail fell in the respective States:

Arizona, 4, 9, 10, 20, 27. Arkansas, 11, 12, 21, 22. California, 8, 9, 10, 16, 22, 23, 24. Illinois, 9, 11, 12, 22, 25. Indiana, 9, 25. Iowa, 11. Kansas, 11. Kentucky, 22, 25. Louisiana, 21. Maryland, 25. Mississippi, 21. Missouri, 9, 11, 12, 14, 24, 25. Ohio, 25. Oklahoma, 11. Oregon, 6, 7, 8, 16, 17, 19, 21, 22, 23. Tennessee, 11, 25. West Virginia, 25.

SLEET.

The following are the dates on which sleet fell in the respective States:

Alabama, 29, 30. Arizona, 2, 9, 28. Arkansas, 29. California, 6, 8, 9, 10, 22, 23. Colorado, 29. Connecticut, 15, 20, 22, 23. Delaware, 9, 25, 31. District of Columbia, 25. Georgia, 11, 30. Illinois, 9, 12, 14, 15, 19, 20, 22, 25, 30. Indiana, 6, 10, 22, 24, 25, 26, 29, 30. Iowa, 11, 12, 19, 24, 25. Kansas, 10, 11, 12, 14, 18, 19, 24, 27. Kentucky, 6, 9, 11, 16, 29, 30, 31. Maine, 18. Maryland, 9, 10, 16, 19, 20, 22, 23, 25, 26, 31. Massachusetts, 1, 14, 15, 20, 23, 24. Michigan, 6, 9, 11, 19, 22, 25, 27. Minnesota, 11. Mississippi, 11. Missouri, 6, 7, 9, 10, 11, 14, 19, 20, 21, 22, 23, 24, 25, 29, 30, 31. Montana, 19, 27. Nebraska, 10, 11, 12, 23, 24, 25. New Hampshire, 1, 12, 13, 15, 20, 23. New Jersey, 1, 9, 10, 15, 19, 20, 22, 25, 31. New Mexico, 28. New York, 6, 8, 12, 15, 19, 20, 21, 22, 23, 25. North Carolina, 6, 17, 18, 19, 20, 25, 31. North Dakota, 27. Ohio, 5, 6, 9, 22, 24, 25, 26. Oklahoma, 11, 14, 18, 19, 23, 24, 29. Oregon, 2, 21, 23, 24, 29, 30. Pennsylvania, 9, 10, 12, 14, 16, 19, 20, 22, 23, 24, 25. Rhode Island, 31. South Carolina, 30, 31. South Dakota, 10, 22. Tennessee, 14, 16, 19, 29, 31. Texas, 13, 18, 19. Utah, 10, 26, 28. Vermont, 14, 15, 19, 22, 23, 26. Virginia, 9, 18, 19, 20, 25, 31. Washington, 2, 3, 5, 7, 8, 9, 10, 14, 17, 18, 20, 22. West Virginia, 9, 19, 20, 24, 25. Wisconsin, 11, 12, 13, 19.

HUMIDITY.

The humidity observations of the Weather Bureau are divided into two series; the first or tridaily series began in 1871 and ended with 1887; the second or twice-daily series is continuous from 1888 to the present time.

In the present state of knowledge respecting the diurnal variation in the moisture of the air, we are scarcely warranted in combining the two series in a general mean.

The monthly means of the second or present series are based upon observations of the whirled psychrometer at 8 a. m. and 8 p. m., seventy-fifth meridian time, which corresponds to 5 a. m. and 5 p. m., Pacific; 6 a. m. and 6 p. m., Mountain; and 7 a. m. and 7 p. m., Central standard time.

In using the table by means of which the amount of moisture in the air is computed from the readings of the wet and dry bulb thermometers, the pressure argument has almost always been neglected, an omission that has little significance except for low temperatures and at high stations, such as Santa Fe, El Paso, Cheyenne, and a few others. The failure to apply a correction for the influence of the prevailing pressure on the psychrometer has the effect of making the monthly means of relative humidity at high level stations too small by quantities ranging from 5 to 10 per cent. In the application of the monthly averages of the table below, or those of individual stations in Table I, to special inquiries, whether in the departments of biology, climatology, or sanitary science, this fact should be kept in mind. It should also be remembered that the hours at which observations in the Rocky Mountain Plateau Region are made, viz, from 5 to 6 local mean time, morning and afternoon, give approximately the maximum and minimum values for the day; therefore, monthly means calculated from such hours approach more nearly the true mean of the month than is the case on the Atlantic seaboard and in the seventy-fifth meridian time belt.

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	76	0	Missouri Valley	78	0
Middle Atlantic	75	0	Northern Slope	72	+2
South Atlantic	76	−2	Middle Slope	70	+3
Florida Peninsula	79	−3	Southern Slope	64	0
East Gulf	82	+4	Southern Plateau	52	+1
West Gulf	77	+2	Middle Plateau	73	+4
Ohio Valley and Tennessee	79	+2	Northern Plateau	84	+3
Lower Lake	80	−1	North Pacific Coast	83	−4
Upper Lake	83	+1	Middle Pacific Coast	72	−9
North Dakota	78	−3	South Pacific Coast	67	−7
Upper Mississippi Valley	79	+1			

The normal for any district can be obtained by adding the departure to the average of the current month when the current humidity is below the normal (—), and subtracting it when it is above (+).

The great dryness on the Pacific Coast is the only notable feature of the month.

WIND.

High winds and local storms.—The winds of the month were not as boisterous as usual, except on the 20th, and again on the 23d, 24th, and 25th. Maximum wind velocities of 50 miles per hour and over occurred in Tennessee, the Ohio Valley, and the Lake Region on the 20th, but the damage done was mostly of a minor character.

The maximum velocities during the storm of the 22–23d in the Lake Region were 72 miles per hour from the west at Cleveland, 68 from the west at Buffalo, 66 from the northeast at Chicago; on the Atlantic Coast, 61 miles from the west at New York, and 60 from the east at Eastport.

Following are the velocities of 50 miles and over per hour registered during the month:

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
		Miles				*Miles*	
Abilene, Tex	25	60	w.	El Paso, Tex	24	69	sw.
Amarillo, Tex	11	56	sw.	Erie, Pa	20	50	s.
Atlantic City, N. J	26	50	nw.	Fort Canby, Wash	13	50	se.
Block Island, R. I	1	50	nw.	Do	18	69	se.
Do	31	60	ne.	Do	21	54	se.
Buffalo, N. Y	2	58	w.	Harrisburg, Pa	23	52	w.
Do	3	54	w.	Indianapolis, Ind	20	54	sw.
Do	8	52	sw.	Do	22	54	sw.
Do	20	55	w.	Do	23	56	sw.
Do	21	50	w.	Do	25	55	nw.
Do	23	68	w.	Knoxville, Tenn	20	54	sw.
Cairo, Ill	22	56	sw.	Lexington, Ky	23	60	sw.
Do	25	53	sw.	Do	25	56	w.
Chattanooga, Tenn	22	58	sw.	Louisville, Ky	25	53	w.
Chicago, Ill	2	54	sw.	Memphis, Tenn	22	50	sw.
Do	22	66	ne.	Do	25	52	w.
Do	25	65	ne.	Nantucket, Mass	31	71	se.
Cleveland, Ohio	23	72	w.	New York, N. Y	23	61	w.
Eastport, Me	1	52	e.	Do	24	50	nw.
Do	23	60	e.	Port Huron, Mich	23	56	w.
El Paso, Tex	11	55	nw.	St. Louis, Mo	25	66	sw.
Do	23	54	sw.	Woods Hole, Mass	3	52	sw.

In the west much snow fell throughout Kansas, Nebraska, Iowa, Missouri, Wisconsin, Illinois, Indiana, Michigan, and Ohio. In Illinois, Wisconsin, and Michigan the snow drifted badly, completely blocking street car traffic in many cities and greatly delaying it in others. Electric wires of all descriptions suffered greatly, owing to the moist character of the snow.

Much damage was done by the gale in the Ohio Valley. In a number of towns buildings were unroofed, windows broken, fences, telegraph, and telephone poles were blown down, while the floods in small rivers and their tributaries added, in some cases, to the destruction already caused by the winds. The storm did not abate in severity in its course to the Atlantic.

One of the most severe wind and snow storms of recent

times swept over New England at the close of the month. Further notice of its severity is reserved for the February issue.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Tornadoes.—Tornadoes have occurred in January in some parts of the United States south of the thirty-eighth parallel in five out of the last ten years.

The tornado which wrought so great destruction of life and property at Fort Smith on the 12th, an account of which appears elsewhere in this REVIEW, does not seem to have been unusually severe or unlike tornadoes that have hitherto been experienced in January. Unfortunately it passed directly through the business and residence portion of the chief city of western Arkansas. Three other storms were observed during the month having the characteristics of tornadoes. The details of each follow:

(1) January 9, 3:50 p. m. (central time), Morganfield, Ky.: One killed; property loss from $12,000 to $18,000. Path of great destruction 30 to 40 feet wide, 750 feet long; moved northeast.

(2) January 12, 12:42 a. m. (local time), Fort Smith, Ark.: Thirty-three killed outright, 19 died from injuries; 73 injured; property loss $450,000. Path of great destruction 300 feet wide, 1 mile long; moved east, 17° north.

(3) January 11, 11 p. m. (central time), Bradleyville, Mo.: One killed, 5 injured; property loss, $3,000. Path of great destruction 300 yards wide 5 miles long; moved northeast. Bradleyville, Mo., is about 125 miles due northeast of Fort Smith, Ark. It would, therefore, appear that the conditions were favorable for the development of tornadoes throughout the central portion of the low area that formed over Arkansas and Missouri on the night of the 11–12th.

(4) January 16, 7 p. m. (central time), Maud, Okla.: No loss of life; 6 buildings destroyed. Path of storm 300 feet wide, length unknown; moved toward the northeast.

SUNSHINE AND CLOUDINESS.

The quantity of sunshine, and therefore of heat, received by the atmosphere as a whole is very nearly constant from year to year, but the proportion received by the surface of the earth depends upon the absorption by the atmosphere, and varies largely with the distribution of cloudiness. The sunshine is now recorded automatically at 21 regular stations of the Weather Bureau by its photographic, and at 47 by its thermal effects. The photographic record sheets show the apparent solar time, but the thermometric records show seventy-fifth meridian time; for convenience the results are all given in Table IX for each hour of local mean time. In order to complete the record of the duration of cloudiness these registers are supplemented by special personal observations of the state of the sky near the sun in the hours after sunrise and before sunset, and the cloudiness for these hours has been added as a correction to the instrumental records, whence there results a complete record of the duration of sunshine from sunrise to sunset.

The average cloudiness of the whole sky is determined by numerous personal observations at all stations during the daytime, and is given in the column "average cloudiness" in Table I; its complement, or percentage of clear sky, is given in the last column of Table IX for the stations at which instrumental self-registers are maintained.

The percentage of clear sky (sunshine) for all of the stations included in Table I, obtained as described in the preceding paragraph, is graphically shown on Chart VII. The regions of cloudy and overcast skies are shown by heavy shading; an absence of shading indicates, of course, the prevalence of clear, sunshiny weather. The formation of fog and cloud is primarily due to differences of temperature in a relatively thin layer of air next to the earth's surface. The relative position of land and water surfaces often greatly increases the tendency to form areas of cloud and fog. This principle is perhaps better exemplified in the Lake Region than elsewhere, although it is of quite general application. The percentage of sunshine on the lee shores of the Lakes is always much less than on the windward shores. Next to the permanent influences that tend to form fog and cloud may be classed the frequency of the passage of cyclonic areas. The greater number of such areas during the current month moved from Texas to the Lake Region by way of the Mississippi and Ohio valleys. As might be expected, an area of diminished sunshine appears on the chart almost coincident with the average path of the cyclonic storms of the month. It is to be noticed, moreover, that the percentage of sunshine diminishes rapidly as the Lake Region is approached, particularly in the Ohio Valley.

The stations that have the least sunshine are Rochester, Grand Haven, Erie, Pittsburg, Parkersburg, Buffalo, Sandusky, and Oswego; the greatest are Yuma, Key West, Tampa, Lander, Yankton, Bismarck, Redbluff, Pierre, North Platte, San Diego, Williston, El Paso, and Jupiter.

The average cloudiness by geographic districts, and the departure from the normal conditions are given in the table below. The mean values have been computed from the numerical data of Table I.

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	5.6	−0.2	Missouri Valley	5.0	−0.1
Middle Atlantic	6.2	+0.6	Northern Slope	4.3	−0.3
South Atlantic	4.8	−0.5	Middle Slope	4.9	+1.1
Florida Peninsula	3.3	−1.4	Southern Slope	4.6	+0.8
East Gulf	5.7	+0.1	Southern Plateau	3.8	+0.9
West Gulf	5.9	+0.5	Middle Plateau	4.9	+0.1
Ohio Valley and Tennessee	6.8	+0.4	Northern Plateau	6.8	−0.5
Lower Lake	8.0	+0.5	North Pacific Coast	7.5	+0.4
Upper Lake	6.8	0.0	Middle Pacific Coast	4.8	−0.3
North Dakota	4.0	−0.7	South Pacific Coast	4.6	+0.5
Upper Mississippi Valley	5.5	+0.2			

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IX, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 25th, 223; 11th, 141; 12th, 128; 22d, 81; and 9th, 78.

Reports were most numerous from Missouri, 109; Ohio, 105; Indiana, 85; and Arkansas, 75.

In Canada.—Thunderstorms were reported at Grand Manan, 23d; Yarmouth, 13th, 23d; Toronto and Port Stanley, 12th.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz, from the 3d to the 11th, inclusive.

The greatest number of reports were received for the following dates: 16th, 26; 18th, 15; 17th, 9.

Reports were most numerous from Montana, 13; North Dakota, 13; Illinois, 7; Minnesota and Ohio, 6 each.

In Canada.—Auroras were reported as follows: Father Point, 17, 18, 25; Port Arthur, 1, 19; Winnipeg, 16, 18; Minnedosa, 1, 10, 16, 17, 20, 25, 28; Qu'Appelle, 16, 21, 22; Medicine, Hat, 16; Swift Current, 17, 26; Prince Albert, 25; Battleford, 16, 26.